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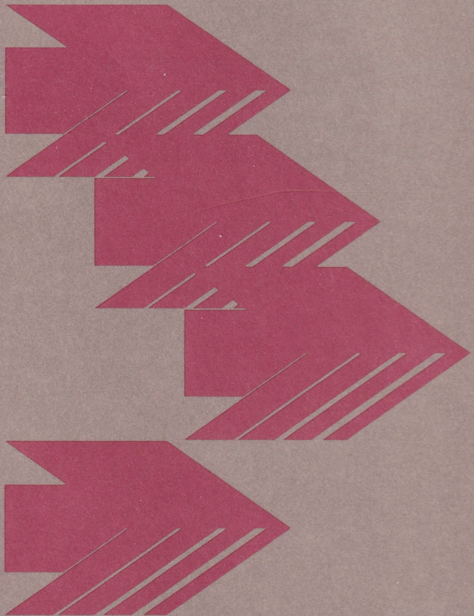
IBM

IBM 3380 Direct Access Storage: Reference Summary

Storage
Subsystem
Library



Order Number
GX26-1678-2

3380 Device Characteristics

Physical Characteristics	AE4, BE4	A04, AA4, B04 AD4, BD4
Head and Disk Assemblies	2	2
per unit	2	2
Access Mechanisms (volumes) per Head and Disk Assembly	2	2
Heads per Access Mechanism (volume)		
Data	15	15
Servo	1	1
Cylinder per Access Mechanism (volume)		
Data	1,770	885
Alternate	1	1
Customer Engineer	1	1
Data Tracks per Cylinder	15	15
Tracks per Access Mechanism (volume)		
Data	26,550	13,275
Alternates	15	15
Maximum Data Capacity		
per Track	47,476 bytes	47,476 bytes
per Cylinder	712,140 bytes	712,140 bytes
per Access Mechanism (volume)	1,260.0 Mb	630.2 Mb
per Head and Disk Assembly	2.52 Gb	1.26 Gb
per Unit	5.04 Gb	2.52 Gb
per 4-unit String	20.16 Gb	10.08 Gb

Performance Characteristics	AE4 BE4	AD4 BD4	A04, AA4 B04
Seek Time[1]			
Minimum	3.0	3.0	3.0 ms
Average	17.0	15.0	16.0 ms
Maximum	31.0	28.0	30.0 ms
Rotational Delay Time[2]	8.3	8.3	8.3 ms
Data Rate[3]	3.0	3.0	3.0 Mb/sec

Notes:

1. **Seek time, or access motion time,** *is the time required to position the access mechanism at the track (cylinder). The average seek time is for one-third of the cylinders. If the mechanism is already at the correct track (cylinder), there is no access motion and seek time is zero.*

2. **Rotational delay time, or rotational latency time,** *is the average time required for the specified record to rotate to the read and write head so that the data transfer can begin. It is one-half the disk rotation time.*

3. **Data rate** *is the instantaneous speed at which bytes are transferred.*

Comparisons Performance and Physical Characteristics	3380 AE4, BE4	3380 AD4, BD4	3380 A04 AA4, B04	3375	3350	3340	3330
Seek Time (ms) Average	17	15	16	19	25	25	30
Full Track Rotation Time (ms)	16.7	16.7	16.7	20.2	16.7	20.24	16.7
Data Transfer Rate (Mb/sec)	3.0	3.0	3.0	1.859	1.198	0.885	0.806
Mb Capacity per Unit	5,040	2,520	2,520	819.7	635	140	200 or 400
Mb Capacity per Drive	2,520	1,260	1,260	819.7	317.5	70	100 or 200
Mb Capacity per Access Mechanism (volume)	1,260	630	630	409.8	317.5	70	100 or 200
Mb Capacity per Fixed Head Unit	0	0	0	0	2.28	0.5	0
Data Cylinders per Access Mechanism (volume)	1,770	885	885	959	555	696	404 or 808
Tracks per Cylinder	15	15	15	12	30	12	19
Bytes per Track	47,476	47,476	47,476	35,616	19,069	8,368	13,030
Bytes per Cylinder	712,140	712,140	712,140	427,392	572,070	100,416	247,570

Ratio of Access Mechanisms (volumes) for Approximate Equivalent Capacity	3380 AE4, BE4	3380 AD4, BD4 A04, AA4, B04	3375	3350	3340	3330
Number of Access Mechanisms (volumes)	1	2	3	4	18	6

GX26-1678-02

Space Calculations

Space calculations are determined for physical records. The data length (DL) value of the physical record is the block size.

Note: *Although a block of 47,476 bytes can be placed on a 3380 track, **the largest block size supported by IBM-supplied access methods is 32,760 bytes.***

All data on a 3380 is written in 32-byte increments.

Space Calculation Formula

The number of equal length physical records per track can be calculated as follows. Track overhead for the home address, track descriptor record (R0), and skip defect allowance has already been accounted for.

$$\text{Equal length records per track} = \frac{1499}{C + K + D}$$

1499	is the number of 32-byte increments per track available for user data records.
C	is the number of 32-byte increments used by the record overhead including gaps and the count area.
K	is the number of 32-byte increments used by the key area.
D	is the number of 32-byte increments used by the data area.
KL	is the key length in bytes.
DL	is the data length in bytes.

where $C = 15$

$$K^{\dagger} = 7 + \frac{KL + 12}{32} \quad \text{if } KL \neq 0$$

$$D^{\dagger} = \frac{DL + 12}{32}$$

† These values are rounded up to the next integer. KL and DL each must have 12 added and each must be rounded up to a multiple of 32.

For unequal length records, the MVS TRKCALC macro can be used for space calculations.

Space Calculation Tables

The following tables show the number of equal length records of a given size (that is, amount of user data) that can be placed on a track and cylinder. Also shown is the maximum amount of user data that the track and cylinder will contain (n records at DL bytes each). For all three tables, the size of the record is a data length (DL) within the range shown; all other adjustments and calculations have been made.

Table 1 shows calculated data for records without keys. For example, three hundred 4000-byte physical records (consisting of 80-byte records blocked 50:1) are to be copied to the 3380. From Table 1, notice that 10 records (within the range 3861 - 4276) can fit on a track and 150 records can fit on a cylinder.

Data set allocation:
300 records ÷ 150 records/cylinder = 2 cylinders

User data per track:
10 records/track x 4000 bytes (DL) = 40,000 bytes

User data per cylinder:
40,000 bytes/track x 15 tracks/cylinder = 600,000 bytes

Note: *The track capacity in the table assumes that 10 records of the largest size possible, 4276 bytes, are written to the track.*

The other two tables show calculated data for records with keys. To determine the number of physical records per track if the key length (KL) is:

- Between 1 and 20, use Table 2.
- Between 21 and 52, use Table 3.
- Greater than 52, use the Space Calculation Formula (shown previously).

For example, a directory for a partitioned data set (PDS) is to be copied to a 3380. You've allocated 6000 blocks for the directory. Each PDS directory block (that is, physical record) consists of an 8-byte key and a 256-byte data area. From Table 2, notice that 46 blocks (within the range 245 - 276) can fit on a track and 690 blocks can fit on a cylinder.

Directory allocation:
6000 directory blocks ÷ 690 blocks/cylinder = 9 cylinders (actually, 8 cylinders and 11 tracks)

Directory entry data per track:
46 blocks/track x 256 bytes/block = 11,776 bytes

Directory entry data per cylinder:
11,776 bytes/track x 15 tracks/cylinder = 176,640 bytes

Note: *The track capacity in the table assumes that 46 records of the largest size possible, 276 bytes, are written to the track.*

Table 1

Equal Length Physical Records Without Keys

DL Bytes		Track Capacity		Cylinder Capacity	
Min	Max	Records	Bytes	Records	Bytes
23,477	47,476	1	47,476	15	712,140
15,477	23,476	2	46,952	30	704,280
11,477	15,476	3	46,428	45	696,420
9,077	11,476	4	45,904	60	688,560
7,477	9,076	5	45,380	75	680,700
6,357	7,476	6	44,856	90	672,840
5,493	6,356	7	44,492	105	667,380
4,821	5,492	8	43,936	120	659,040
4,277	4,820	9	43,380	135	650,700
3,861	4,276	10	42,760	150	641,400
3,477	3,860	11	42,460	165	636,900
3,189	3,476	12	41,712	180	625,680
2,933	3,188	13	41,444	195	621,660
2,677	2,932	14	41,048	210	615,720
2,485	2,676	15	40,140	225	602,100
2,325	2,484	16	39,744	240	596,160
2,165	2,324	17	39,508	255	592,620
2,005	2,164	18	38,952	270	584,280
1,877	2,004	19	38,076	285	571,140
1,781	1,876	20	37,520	300	562,800
1,685	1,780	21	37,380	315	560,700
1,589	1,684	22	37,048	330	555,720
1,493	1,588	23	36,524	345	547,860
1,397	1,492	24	35,808	360	537,120
1,333	1,396	25	34,900	375	523,500
1,269	1,332	26	34,632	390	519,480
1,205	1,268	27	34,236	405	513,540
1,141	1,204	28	33,712	420	505,680
1,077	1,140	29	33,060	435	495,900
1,045	1,076	30	32,280	450	484,200
981	1,044	31	32,364	465	485,460
949	980	32	31,360	480	470,400
917	948	33	31,284	495	469,260
853	916	34	31,144	510	467,160
821	852	35	29,820	525	447,300
789	820	36	29,520	540	442,800
757	788	37	29,156	555	437,340
725	756	38	28,728	570	430,920
693	724	39	28,236	585	423,540
661	692	40	27,680	600	415,200
629	660	41	27,060	615	405,900
597	628	42	26,376	630	395,640
565	596	44	26,224	660	393,360
533	564	45	25,380	675	380,700
501	532	46	24,472	690	367,080
469	500	48	24,000	720	360,000
437	468	49	22,932	735	343,980
405	436	51	22,236	765	333,540
373	404	53	21,412	795	321,180
341	372	55	20,460	825	306,900
309	340	57	19,380	855	290,700
277	308	59	18,172	885	272,580
245	276	62	17,112	930	256,680
213	244	65	15,860	975	237,900
181	212	68	14,416	1,020	216,240
149	180	71	12,780	1,065	191,700
117	148	74	10,952	1,110	164,280
85	116	78	9,048	1,170	135,720
53	84	83	6,972	1,245	104,580
21	52	88	4,576	1,320	68,640
0	20	93	1,860	1,395	27,900

Table 2

Equal Length Physical Records With Keys

KL = 1 to 20

DL Bytes		Track Capacity		Cylinder Capacity	
Min	Max	Records	Bytes	Records	Bytes
23,221	47,220	1	47,220	15	708,300
15,221	23,220	2	46,440	30	696,600
11,221	15,220	3	45,660	45	684,900
8,821	11,220	4	44,880	60	673,200
7,221	8,820	5	44,100	75	661,500
6,101	7,220	6	43,320	90	649,800
5,237	6,100	7	42,700	105	640,500
4,565	5,236	8	41,888	120	628,320
4,021	4,564	9	41,076	135	616,140
3,605	4,020	10	40,200	150	603,000
3,221	3,604	11	39,644	165	594,660
2,933	3,220	12	38,640	180	579,600
2,677	2,932	13	38,116	195	571,740
2,421	2,676	14	37,464	210	561,960
2,229	2,420	15	36,300	225	544,500
2,069	2,228	16	35,648	240	534,720
1,909	2,068	17	35,156	255	527,340
1,749	1,908	18	34,344	270	515,160
1,621	1,748	19	33,212	285	498,180
1,525	1,620	20	32,400	300	486,000
1,429	1,524	21	32,004	315	480,060
1,333	1,428	22	31,416	330	471,240
1,237	1,332	23	30,636	345	459,540
1,141	1,236	24	29,664	360	444,960
1,077	1,140	25	28,500	375	427,500
1,013	1,076	26	27,976	390	419,640
949	1,012	27	27,324	405	409,860
885	948	28	26,544	420	398,160
821	884	29	25,636	435	384,540
789	820	30	24,600	450	369,000
725	788	31	24,428	465	366,420
693	724	32	23,168	480	347,520
661	692	33	22,836	495	342,540
597	660	34	22,440	510	336,600
565	596	35	20,860	525	312,900
533	564	36	20,304	540	304,560
501	532	37	19,684	555	295,260
469	500	38	19,000	570	285,000
437	468	39	18,252	585	273,780
405	436	40	17,440	600	261,600
373	404	41	16,564	615	248,460
341	372	42	15,624	630	234,360
309	340	44	14,960	660	224,400
277	308	45	13,860	675	207,900
245	276	46	12,696	690	190,440
213	244	48	11,712	720	175,680
181	212	49	10,388	735	155,820
149	180	51	9,180	765	137,700
117	148	53	7,844	795	117,660
85	116	55	6,380	825	95,700
53	84	57	4,788	855	71,820
21	52	59	3,068	885	46,020
0	20	62	1,240	930	18,600

ex.
Blksize = 4000
10 Blk/Trk
150 Blk/Cyl

Table 3

Equal Length Physical Records With Keys

KL = 21 to 52

DL Bytes		Track Capacity		Cylinder Capacity	
Min	Max	Records	Bytes	Records	Bytes
23,189	47,188	1	47,188	15	707,820
15,189	23,188	2	46,376	30	695,640
11,189	15,188	3	45,564	45	683,460
8,789	11,188	4	44,752	60	671,280
7,189	8,788	5	43,940	75	659,100
6,069	7,188	6	43,128	90	646,920
5,205	6,068	7	42,476	105	637,140
4,533	5,204	8	41,632	120	624,480
3,989	4,532	9	40,788	135	611,820
3,573	3,988	10	39,880	150	598,200
3,189	3,572	11	39,292	165	589,380
2,901	3,188	12	38,256	180	573,840
2,645	2,900	13	37,700	195	565,500
2,389	2,644	14	37,016	210	555,240
2,197	2,388	15	35,820	225	537,300
2,037	2,196	16	35,136	240	527,040
1,877	2,036	17	34,612	255	519,180
1,717	1,876	18	33,768	270	506,520
1,589	1,716	19	32,604	285	489,060
1,493	1,588	20	31,760	300	476,400
1,397	1,492	21	31,332	315	469,980
1,301	1,396	22	30,712	330	460,680
1,205	1,300	23	29,900	345	448,500
1,109	1,204	24	28,896	360	433,440
1,045	1,108	25	27,700	375	415,500
981	1,044	26	27,144	390	407,160
917	980	27	26,460	405	396,900
853	916	28	25,648	420	384,720
789	852	29	24,708	435	370,620
757	788	30	23,640	450	354,600
693	756	31	23,436	465	351,540
661	692	32	22,144	480	332,160
629	660	33	21,780	495	326,700
565	628	34	21,352	510	320,280
533	564	35	19,740	525	296,100
501	532	36	19,152	540	287,280
469	500	37	18,500	555	277,500
437	468	38	17,784	570	266,760
405	436	39	17,004	585	255,060
373	404	40	16,160	600	242,400
341	372	41	15,252	615	228,780
309	340	42	14,280	630	214,200
277	308	44	13,552	660	203,280
245	276	45	12,420	675	186,300
213	244	46	11,224	690	168,360
181	212	48	10,176	720	152,640
149	180	49	8,820	735	132,300
117	148	51	7,548	765	113,220
85	116	53	6,148	795	92,220
53	84	55	4,620	825	69,300
21	52	57	2,964	855	44,460
0	20	59	1,180	885	17,700

Third Edition (March 1986)

This is a major revision of, and makes obsolete, GX26-1678-1.

This reference summary is based on information in the *IBM 3380 Direct Access Storage: General Information*, GC26-4193, *IBM 3380 Direct Access Storage: Planning and Use*, GC26-4208, and *IBM 3380 Direct Access Storage: Migration*, GC26-4197.

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